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(to be used for all correspondence after initial filing)

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First Named Inventor	Withers, et al.
Group Art Unit	3723
Examiner Name	Hadi Shakeri
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ENCLOSURES *(check all that apply)*

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment / Response
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
- ☐ Certified Copy of Priority Document(s)
- ☐ Response to Missing Parts/ Incomplete Application
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- ☐ After Allowance Communication to Group
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- ☒ Appeal Communication to Group ***(Appeal Brief, 31 pages)*** (3 copies)
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- ☐ Status Letter
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SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Keith Taboada, Esq. Moser, Patterson & Sheridan, LLP
Signature	
Date	December 1, 2003

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Typed or printed name	Allyson M. DeVesty		
Signature	Allyson M. DeVesty	Date	December 1, 2003

IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

PATENT APPLICATION

Appellant: **Withers, et al.** Case: **5646/CMP/CMP/RKK**

Serial No.: **09/921,588** Filed: **August 2, 2001**

Examiner: **Shakeri, Hadi** Group Art Unit: **3723**

Confirmation No.: **9496**

Title: **MULTIPORT POLISHING FLUID DELIVERY SYSTEM**

BRIEF ON APPEAL

Mail Stop Appeal Brief – Patents
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Sir:

The following Appeal Brief is submitted pursuant to the Notice of Appeal filed on September 25, 2003 and received in the Patent Office on September 29, 2003 in the above-identified application.

REAL PARTY IN INTEREST

The real party in interest is:

Applied Materials, Inc.
P.O. Box 450A
Santa Clara, CA 95052

RELATED APPEALS AND INTERFERENCES

The Appellants, Appellants' legal counsel, or the Assignee knows no other appeals or interferences that directly affect, or are directly affected by, or have a bearing on the Board's decision in the pending appeal.

STATUS OF CLAIMS

Claims 1-27 and 30-39 stand under final rejection, from which rejection this appeal is taken.

STATUS OF AMENDMENTS

A first Response was filed, prior to the Final Office Action, on September 17, 2002. The first Response amended claims 3 and 12, and added claims 28-29.

The Examiner responded to Appellants' September 17, 2002 Response in a Final Office Action dated October 29, 2002. In the Final Office Action, the Examiner found the Appellants' arguments regarding the patentability of claims 1-29 unpersuasive, and substantially reiterated the same reasons for rejecting the claims as stated in the Office Action of July 5, 2002. The Examiner added additional grounds in support of his position.

After the Final Office Action was received, the Appellants filed a Request for Continued Examination (RCE) on January 24, 2003. The RCE was accompanied by a Response that cancelled claims 28-29, amended claims 1, 19, 23 and 26 and added new claims 30-39, and presented arguments regarding the patentability of claims 1-27 and 30-39. The first Response included arguments directed at traversing the Examiner's 35 U.S.C. §102, 103 and 112 rejections.

The Examiner responded to the Appellants' January 24, 2003 Response in an Office Action dated February 11, 2003. In the Office Action, the Examiner found Appellants' arguments with respect to claims 1-27 and 30-39 moot in view of new grounds for rejection.

The Appellants responded to the February 11, 2003 Office Action with a Response dated April 18, 2003. The April 18, 2003 Response amended claims 23 and 25 to correct minor typographical errors and provided arguments regarding the patentability of claims 1-27 and 30-39. The Response of February

11, 2003 included Declarations by inventors B. Withers and B. Ming that declare conception and reduction of practice for the claimed invention before the filing date of the reference cited by the Examiner in his February 11, 2003 Office Action. The Response additionally included arguments regarding the patentability of claims 1-27 and 30-39.

The Examiner responded to the Appellants' April 18, 2003 Response in a Final Office Action dated June 25, 2003. In the Final Office Action, the Examiner withdrew one rejection in view of the Declarations, but found the remainder of the Appellants' arguments unpersuasive.

After the Final Office Action was received, the Appellants filed an Amendment After Final dated August 25, 2003 amending claims 1 and 19, and presenting arguments directed at the patentability of claims 1-27 and 30-39. The Examiner responded to the Appellants' August 25, 2003 response in an Advisory Action dated September 10, 2003. The Advisory Action stated that the proposed amendment of September 25, 2003 would not be entered, as the Examiner deemed the amendment not to place the application in better form for appeal.

In response to the Advisory Action dated September 10, 2003, the Appellants filed a Response to the Advisory Action on September 25, 2003. The September 25, 2003 Response re-introduced the previously unentered amendments to claims 1 and 19 and amended claim 9. The Response of September 25, 2003 included arguments directed at the patentability of claims 1-27 and 30-39 and reasons why the claims presented are in better form for appeal. The Examiner did not find the Response of September 25 2003 persuasive, and did not enter the proposed amendments. After the Advisory Action of September 10, 2003, the Appellants filed a Notice of Appeal on September 25, 2003.

SUMMARY OF INVENTION

The present invention is a system and method for delivering polishing fluid to a chemical mechanical polishing surface. In one embodiment, the system includes an arm having a delivery portion disposed at least partially over the polishing surface. A first nozzle and a second nozzle are disposed on the delivery portion of the arm. The first nozzle is adapted to flow the polishing fluid at a first rate to a first zone defined on the polishing surface of the polishing material. The second nozzle is adapted to flow the polishing fluid at a second rate that is different than the first rate to a second zone defined on the polishing surface of the polishing material, wherein the first nozzle dispenses a greater volume of polishing fluid on the first zone of the polishing surface as it interfaces with the substrate than polishing fluid of equal concentration dispensed on the second zone of the polishing surface by the second nozzle.

A. BACKGROUND OF THE INVENTION

In semiconductor wafer processing, the use of chemical mechanical planarization, or CMP, has gained favor due to the enhanced ability to increase device density on a semiconductor workpiece, or substrate, such as a wafer. Chemical mechanical planarization systems generally utilize a polishing head to retain and press a substrate against a polishing surface of a polishing material while providing motion therebetween. Some planarization systems utilize a polishing head that is moveable over a stationary platen that supports the polishing material. Other systems utilize different configurations to provide relative motion between the polishing material and the substrate, for example, providing a rotating platen and movable polishing head. A polishing fluid is typically disposed between the substrate and the polishing material during polishing to provide chemical activity that assists in the removal of material from the substrate. Some polishing fluids may also contain abrasives.

One of the challenges in developing robust polishing systems and processes is providing uniform material removal across the polished surface of the substrate. For example, as the substrate travels across the polishing surface, the edge of the substrate is often polished at a higher rate. This is due in part to the tendency of the substrate to "nose drive" due to frictional forces as the substrate moves across the polishing surface.

Another problem affecting polishing uniformity across the substrate's surface is the tendency of some materials to be removed faster than the surrounding materials. For example, copper is generally removed more rapidly than the material surrounding the copper material (typically an oxide) during polishing. The faster removal of copper can result in more copper being removed than the surrounding oxide, resulting in "dishing" of the copper. Dishing is particularly evident when the width of the copper surface exceeds five microns.

Although many solutions have been utilized in order to mitigate the non-uniformity of the substrate as a result of polishing, none have proved to be completely satisfactory. Thus, the demand for uniform, highly planarized surfaces is still a paramount concern due to the trend toward smaller decreased line sizes and increased device density. Therefore, there is a need for systems and methods for improving polishing uniformity.

B. DESCRIPTION OF THE INVENTION

In the present invention, the Appellants have described and claimed a novel system and method for delivering polishing fluid to a chemical mechanical polishing surface. The present system and method is described on pages 3-12 of the Appellants' specification with reference to one embodiment of a delivery system depicted in Figure 1, a plan view of the delivery system of Figure 1 depicted in Figure 2, another embodiment of a delivery system depicted in Figure 3, and a graphic comparison of polishing uniformity utilizing the present system with polishing uniformity obtained using a conventional polishing fluid delivery system depicted in Figure 4.

Briefly, one embodiment of a polishing system in which the Appellants' polishing system for controlling the distribution of polishing fluid across a polishing material is depicted in Figure 1. In the embodiment, a polishing system 100 is provided that includes a platen 104, a polishing head 106 and a delivery system 102 for delivering polishing fluid 114. The polishing head 106 holds a substrate 112 against a polishing material 108 disposed on the platen 104 during polishing.

The platen 104 is disposed on a base 122 of the system 100. A motor (not shown) rotates the platen 104 to provide at least a portion of the relative motion between the substrate 122 and polishing material 108 during processing. *See*, page 7, paragraph 16.

The polishing fluid delivery system 102 generally comprises a delivery arm 130, a plurality of nozzles 132 disposed on the arm 130 and at least one polishing fluid source 134. The delivery arm 130 is generally coupled to the base 122 proximate the platen 104 and has at least a portion 136 that can be suspended over the polishing material 108. The nozzles 132 are disposed along the portion 136 of the delivery arm 130 which is disposed above the platen 104 and are configured to meter polishing fluid 114 at different flow rates along the arm 130 to control the distribution of polishing fluid 114 on the polishing surface 116 of the polishing material 108. As the polishing fluid 114 is generally supplied from a single source, the polishing fluid 114 is disposed on the polishing material 108 in a uniform concentration but in varying amounts along the diameter of the polishing material 108. The distribution of polishing fluid 114 across the polishing material 108 is controlled by flowing polishing fluid 114 from the first nozzle 140 at a rate different than the flow from the second nozzle 142.

As depicted in Figure 2, the first nozzle 140 generally flows polishing fluid 114 at a first rate to a first portion 202 of the polishing surface 116 while the second nozzle 142 flows polishing fluid 114 at a second rate to a second portion 104 of the polishing surface 116. In this manner, the distribution of polishing fluid 114 across the width of the polishing material 108 is regulated.

The polishing fluid 114 contained in the reservoir 152 is typically de-ionized water having chemical additives that provide chemical activity that assists in the removal of material from the surface of the substrate 112 being polished. As the polishing fluid 114 is supplied to the nozzles 132 from a single source (*i.e.,* the reservoir 152), the fluid 114 flowing from the nozzles 132 is substantially homogeneous, i.e., not varied in concentration of chemical reagents or entrained abrasives. *See*, page 5, paragraph 21 through page 7, paragraph 28.

Figure 2 is a plan view of the system 100 illustrating the flow of polishing fluid 114 onto the portions 202 and 204 of the polishing material 108. A first flow 206 of polishing fluid 114 flows out the first nozzle 140 and onto the first portion 202 at a first rate while a second flow 208 of polishing fluid 114 flows out the second nozzle 142 and onto the second portion 204 at a second rate. *See*, page 5, lines 24-31.

Figure 3 depicts another embodiment of a polishing fluid delivery system 300 having a plurality of nozzles 302. The system 300 may be configured similarly to the fluid delivery system 102 of Figure 1 (*i.e.,* having a single polishing fluid delivery line), or may be configured so that each nozzle 302 has a dedicated supply line 304 coupled to a fluid source 306. Fluidly coupled to each supply line 304 is a metering device 308. The metering device 308 may be a metering pump such as a gear pump, a peristaltic pump, a positive displacement pump, a diaphragm pump and the like. Each metering device 308 is coupled to a controller (not shown) that controls the amount of polishing fluid 114 provided to each nozzle 302 of the system 300. As each metering device 308 is independently controllable, the flow of polishing fluid 114 from each of the plurality of nozzles 302 is controlled independent from the other nozzles so that the distribution of polishing fluid 114 on the polishing material 108 can be arranged in practically infinite configurations. *See*, page 6, lines 20-29.

Figure 4 is a graph of polishing uniformity 402 resulting from a process utilizing the polishing fluid delivery system 102 with a graph of polishing uniformity 404 achieved utilizing a conventional polishing fluid delivery system

(*i.e.*, systems where polishing fluid is delivered to the polishing material solely from a single nozzle or tube) having the same total polishing fluid flow. Figure 4 illustrates that the uniformity 402 using the inventive system is improved over conventional results 404. *See*, page 14, lines 8-33.

Claims 1, 16, 19, 23 and 30-31, and those claims depending therefrom, are supported at least by Figures 1-4 and the description at least at pages 3-12.

ISSUES

Whether:

A. Claims 1-25, 30-33, and 35-39 are patentable under 35 U.S.C. §103 over *Kimura* et al., (United States Patent No. 5,679,063) in view of *Nagahara*, (United States Patent No. 5,816,900);

B. Claims 26 and 27 are patentable under 35 U.S.C. §103 over *Kimura* et al. (United States Patent 5,679,063) in view of *Nagahara*, (United States Patent No. 5,816,900), as applied to claim 23 above, and in view of *Winebarger*, (United States Patent No. 5,433,650).

C. Claim 34 is patentable under 35 U.S.C. §103 over *Kimura* et al. (United States Patent 5,679,063) in view of *Nagahara*, (United States Patent No. 5,816,900), as applied to claim 31 above, and in view of *Kennedy*, (United States Patent No. 6,139,406).

GROUPING OF CLAIMS

The rejected claims have been grouped together in the rejections. The first issue relates to the rejection of claims 1-15 and 19-22 as being unpatentable under 35 U.S.C. §103 over *Kimura* et al., in view of *Nagahara*, with claim 1 being representative of this grouping. Within this grouping, the patentability of claims 8 and 12-14 are separately addressed. The second issue relates to the rejection

of claims 16-18 as being unpatentable under 35 U.S.C. §103 over *Kimura* et al., in view of *Nagahara*, with claim 16 being representative of this grouping. Within this grouping, the patentability of claim 17 is separately addressed. The third issue relates to the rejection of claims 23-25 as unpatentable under 35 U.S.C. §103 over *Kimura* et al., in view of *Nagahara*, with claim 23 being representative of this grouping. The fourth issue relates to the rejection of claim 30 as being unpatentable under 35 U.S.C. §103 over *Kimura* et al., in view of *Nagahara*. The fifth issue relates to the rejection of claims 31-33 and 35-29 as being unpatentable under 35 U.S.C. §103 over *Kimura* et al., in view of *Nagahara*, with claim 32 being representative of this grouping. Within this grouping, the patentability of claims 36-38 are separately addressed. The sixth issue relates to the rejection of claims 26-27 as patentable under 35 U.S.C. §103 over *Kimura* et al., in view of *Nagahara*, and in further view of *Winebarger* et al., with claim 26 being representative of this grouping. The seventh issue relates to the rejection of claim 34 as patentable under 35 U.S.C. §103 over *Kimura* et al., in view of *Nagahara*, and in further view of *Kennedy*.

THE REFERENCES

The Examiner relies on the following references:

Author	Publication Title or Reference number	Publication Date
Kimura et al.	US Patent No. 5,679,063	October 21, 1997
Nagahara	US Patent No. 5,816,900	October 6, 1998
Winebarger et al.	US Patent No. 5,433,650	July 18, 1995
Kennedy	US Patent No. 6,139,406	October 31, 2000

BRIEF DESCRIPTION OF THE REFERENCES

United States Patent No. 5,679,063 to *Kimura* et al., (hereinafter referred to as "*Kimura*") teaches a polishing apparatus for polishing a surface of an object such as a semiconductor wafer. The polishing apparatus includes a turntable having a polishing cloth mounted thereon and a top ring for holding and pressing the wafer against the polishing cloth. A plurality of radially arranged nozzles are disposed over the polishing cloth and supply a polishing solution of different concentrations that differ along a radial direction of the polishing cloth. *See*, *Kimura*, abstract.

Kimura teaches that it is an object of the present invention to achieve a uniformly flat and mirror polished finish on the wafer. In one example, such object is achieved by supplying an abrasive containing polishing solution of different concentrations differing along radial positions of the polishing cloth. The different concentrations of polishing solutions are stated to provide tuning of the polishing rate by adjusting the concentrations of the polishing solution at respective nozzles. Lowering the concentration of the polishing solution in an area where the removal rate is high correspondingly slows the polishing rate while raising the concentration of the polishing solution in an area where the removal rate is low correspondingly increases the polishing rate in that area. "By providing an optimum distribution of concentrations of the polishing solution along a radial direction, it is possible to improve the flatness of the wafer significantly." *See*, *Kimura*, column 1, line 60 through column 2, line 21.

In another example, *Kimura* teaches to provide polishing solution to a polishing cloth from at least one polishing solution nozzle having a common concentration where the polishing solution is diluted on the cloth by a diluting liquid provided from a plurality of diluting liquid supply nozzles arranged in a radial direction. The diluting liquid supply nozzles provide adjustable volumes of diluting liquid to form a distribution of polishing solution of different concentrations across the polishing cloth.

According to this configuration, one supply nozzle for a polishing solution with a common concentration may be utilized together with several diluting liquid nozzles for supplying adjustable volumes of diluting liquid. The polishing solution with a common concentration can be diluted by the diluting liquid so that an optimum distribution of polishing solution concentrations along a radial direction can be produced, thereby making it possible to improve the flatness of the wafer. *See*, *Kimura*, column 2, lines 21-43.

In another example, *Kimura* teaches to provide polishing solution to a polishing cloth from at least one solution nozzle having a common concentration where the polishing solution is dispersed on the cloth by water that includes a dispersion agent provided from at least one supply nozzle. The dispersion agent and water interacts with the polishing solution form a distribution of polishing solution of different concentrations by diluting the polishing solution across the polishing cloth. *See*, *Kimura*, column 2, line 44 through column 3, line 6.

United States Patent No. 5,816,900 to *Nagahara* et al., (hereinafter referred to as "*Nagahara*") teaches a polishing apparatus that has fluid delivered directly to the wafer through a polishing pad. The fluid may be delivered at dissimilar flow rates and/or pressures across the diameter of the polishing pad. Changing the fluid delivery profile and/or polishing pressure profile allows the removal properties of the fluid to polish material from the wafer surface based on the location of that material relative to the center of the wafer. *See*, *Nagahara*, abstract.

In one example, the removal profile is accomplished by a fluid delivery system that delivers fluid at different rates through the polishing pad. The fluid delivery system operates to channel dissimilar fluid flow rates and/or pressures across the pad backside surface, thereby causing the pad to contact the substrate with varied force and/or amounts of polishing fluid. *See*, *Nagahara*, column 2, line 46 through column 3, line 32.

In one example, the polishing fluid is provided through a polishing pad 16 from a common chamber 44 disposed in a housing 28 supporting the pad 16. The pad 16 may be configured to provide polishing fluid therethrough in different amounts, as shown by arrows 48. *See*, *Nagahara*, column 4, line 30 through column 5, line 55; Figure 2.

United States Patent No. 5,433,650 to *Winebarger* et al., (hereinafter referred to as "*Winebarger*") teaches an apparatus for simultaneously polishing a semiconductor substrate (wafer) and a block of optical quartz. An interferometer is used to monitor the thickness and the polishing rate of the optical quartz block, from which the endpoint of the polishing process can be repeatably detected. *See*, *Winebarger*, abstract. *Winebarger* also teaches that, by monitoring the thickness and the polishing rate of the optical quartz block, the polishing rate may be adjusted, for example, by controlling the frequency that slurry is dispensed onto a rotatable polishing surface. *See*, *Winebarger*, column 4, lines 6-35.

United States Patent No. 6,139,406 to *Kennedy*, (hereinafter referred to as "*Kennedy*") teaches a method and apparatus for delivering one or more rinse agents to a surface, such as a polishing pad surface and one or more polishing fluids. *See*, *Kennedy*, abstract. *Kennedy* also teaches that a single arm may include multiple slurry delivery nozzles and multiple rinse agent nozzles. *See*, *Kennedy*, column 3, line 62 through column 4, line 14.

ARGUMENT

THE ISSUES UNDER 35 U.S.C. §102

It is submitted that a proper interpretation of *Kimura*, *Nagahara*, *Winebarger*, and *Kennedy*, as proposed by the Examiner in the Final Office Action, does not teach or show the invention recited in the Appellants' claims.

A. 35 U.S.C. §103 - Kimura in view of Nagahara

The Appellants respectfully disagrees with the Examiners conclusions regarding the patentability of claims 1-25, 30-33, and 35-39 over *Kimura* in view of *Nagahara*. *Kimura* and *Nagahara* cannot be combined in a manner that teaches or suggests all of the limitations recited by claims 1-25, 30-33, and 35-39.

The Examiner has improperly maintained his rejections despite Appellants' arguments that the references are not properly combinable. Specifically, the Appellants believe that *Kimura* teaches use of at least one nozzle to dispense polishing fluid having a distribution of different concentrations across a polishing surface in order to achieve the desired polishing results. Thus, *Kimura* may not be properly combined with a reference to provide polishing fluid having the same concentration across the polishing surface.

Moreover, *Nagahara* teaches to apply polishing fluid through a pad on which the wafer is polished. Different amounts of polishing fluid may be provided through different portions of the polishing pad to control the amount of fluid and/or pressure exerted by the polishing pad against the substrate to control the polishing rate across the wafer. However, *Nagahara* fails to suggest that the polishing fluid may be delivered through a nozzle. Therefore, *Nagahara* may not be properly combined with *Kimura* as the mode of polishing fluid delivery are non-compatible, and that any combination of *Kimura* and *Nagahara* with regards to polishing fluid delivery would result in a distribution of polishing fluid having different concentration across the surface of the polishing pad.

The burden for establishing a prima facie case of obviousness falls on the Examiner. *See, MPEP* §2142. A basic requirement of establishing a prima facie case of obviousness is that the combination of prior art references must teach or suggest all the claim limitations and that there must be a motivation to combine the references. *See, MPEP* §2143.

The Appellants assert that the Examiner has failed to establish a prima facie case because *Kimura* and *Nagahara* cannot be combined in a manner to

teach or suggest a polishing fluid delivery arm that provides polishing fluid of equal concentration in different amounts to zones on different portions of a polishing surface as the portions interface with a substrate, as recited by the claimed invention. As such, the Examiner failed to properly show that *Kimura* in view of *Nagahara* teaches or suggests all of the features required to sustain the Examiner's rejection under 35 U.S.C. §103 of the Appellants' invention of claims 1-25, 30-33, and 35-39.

1. Claims 1-15 and 19-22

Kimura teaches a polishing apparatus for polishing the surface of an object which supplies a polishing solution of different concentrations along a radial direction of a polishing cloth. (*See, Kimura,* Abstract). Additionally, *Nagahara* teaches delivering a polishing fluid through a polishing pad at dissimilar flow rates to control the polishing pressure and/or amount of fluid delivered through the pad.

The Examiner has expanded upon the teaching of *Kimura* and *Nagahara* by stating that the claimed apparatus is taught by the prior art to support his conclusion of obviousness. Although *Kimura* teaches that dispensing polishing fluid from a plurality of nozzles, it is clearly evident that *Kimura* never contemplated an apparatus that applies a distribution of polishing fluid having the same concentration across a polishing surface.

It is impermissible to use the claims as a framework from which to choose among individual references to recreate the claimed invention. *W. L. Gore Associates, Inc. v. Garlock, Inc.*, 220 U.S.P.Q. 303, 312 (1983). Moreover, the mere fact that a prior art structure could be modified to produce the claimed invention would not have made the modification obvious unless the prior art suggested the desirability of the modification. *In re Fritch*, 23 U.S.P.Q. 2d 1780, 1783, Fed. Cir. (1992); *In re Gordon*, 221 U.S.P.Q. 1125, 1127, Fed. Cir. (1984).

The rules applicable for combining references provide that there must be a suggestion from within the references to make the combination. *Uniroyal v.*

Rudkin-Wiley, 5 U.S.P.Q. 2d 1434, 1438 (Fed. Cir. 1988)., *In re Fine*, 5 U.S.P.Q. 2d at 1599. Additionally, MPEP § 2141.03 requires the Examiner to consider the prior art in its entirety. "A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention". MPEP §2141.03, *W.L. Gore & Associates, Inc., v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed Cir. 1983), cert. denied, 469 U.S. 851 (1984).

The creation and utilization of the concentration gradient is critical to the objective of *Kimura* – "fine tuning of the rate of removal of the surface material of the object by adjusting the concentrations of the polishing solution...," (*See*, *Kimura*, column 2, lines 11-13) – thus teaching away from utilizing a polishing fluid with a uniform concentration as recited by claims 1-25, 30-33, and 35-39. To utilize the teachings of *Kimura*, the Examiner is required to include the fact that the resulting distribution of polishing fluid on the polishing surface must have a distribution of different concentrations as it interfaces with the substrate.

Moreover, the Examiner has mischaracterized the reference in the Final Office Action dated June 25, 2003 by not describing the reference completely.

The Examiner has chosen to ignore the complete teaching of *Kimura* by focusing on only half of the polishing fluid delivery system shown in Figures 3-4 and described in column 5, lines 42. In the embodiment depicted in Figures 3-4, two sets on nozzles are illustrated. The first group of nozzles (14A-14G) provides polishing fluid at a same concentration. The adjacent second group of nozzles (15A-15G) provides water that combines on the polishing surface to "maintain a desired degree of dilution of the polishing solution on the polishing cloth". "As a result, a desired type of radial distribution of concentration of the polishing solution may be produced, making it possible to adjust the amount of material removed ... producing a wafer that is uniformly polished over the entire surface of the wafer." *See*, *Kimura*, column 5, lines 13-32.

Claim 1 recites a first nozzle adapted to flow the polishing fluid at a first rate and a second nozzle adapted to flow the polishing fluid at a second rate that is different than the first rate, wherein the first nozzle dispenses a greater volume

of polishing fluid on a first portion of the polishing surface as it interfaces with the substrate than the polishing fluid of equal concentration dispensed on a second portion of the polishing surface by the second nozzle. Thus, the Examiner is not considering the teachings of *Kimura* as a whole, which only teach to provide a distribution of polishing solution having different concentrations on the polishing surface in order to control the rate of polishing across the diameter of the substrate.

Thus, *Kimura* and *Nagahara* cannot be combined to yield the claimed invention because any combination of *Kimura* and *Nagahara* would include a teaching of supplying polishing fluid at different concentrations to the polishing surface. Moreover, there is no motivation to combine *Kimura* and *Nagahara* in a manner that yields the claimed invention as *Kimura* teaches to control polishing by controlling concentration of fluid applied to the top of the polishing surface while *Nagahara* to control polishing by controlling the amount of fluid and/or pressure exerted by the pad against the substrate by flowing fluid through the pad at different rates. Therefore, the combination of *Kimura* and *Nagahara* teaches a device or method that controls polishing by controlling the flow of polishing fluid having different concentrations to a polishing surface through a polishing pad.

As *Kimura* and *Nagahara* teach away from the claimed invention, *Kimura* and *Nagahara* cannot be combined in a manner to teach or suggest a polishing fluid delivery arm that includes a first nozzle adapted to flow the polishing fluid at a first rate and a second nozzle adapted to flow the polishing fluid at a second rate that is different than the first rate, wherein the first nozzle dispenses a greater volume of polishing fluid on a first portion of the polishing surface as it interfaces with the substrate than the polishing fluid of equal concentration dispensed on a second portion of the polishing surface by the second nozzle, as claimed in the present application.

Thus, claims 1 and 19, and claims 2-15 and 20-22 that depend therefrom, are patentable over *Kimura* in view of *Nagahara*. Therefore, the Appellants

submit that claims 1-15 and 19-25, as they now stand, fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder.

2. Claims 8 and 12-14

Claims 8 and 12-14 depend directly, or indirectly, from claim 1 and recite additional limitations therefor. Since the alleged combination of *Kimura* in view of *Nagahara* do not render claims 1 and 13 obvious, dependent claims 8-12-14 are also not unpatentable and are allowable for the same reason stated above.

Furthermore, dependent claim 8 specifically recites the additional limitation of "wherein each nozzle is independently controllable". Dependent claim 12 recites " wherein the first nozzle is disposed radially inward of the second nozzle relative to a center of rotation of the polishing pad, and wherein the first flow is at least 1.15 times greater than the second flow". Dependent claim 13 recites "wherein first flow is at least 1.15 times the second flow rate." Dependent claim 14 recites wherein the "first flow is about 1.2 to about 20 times the second flow rate." The combination of *Kimura* and *Nagahara* do not teach independently controllable nozzles that dispense a greater volume of polishing fluid on a first zone of a polishing surface as it interfaces with the substrate than the polishing fluid of equal concentration dispensed on a second zone of the polishing surface, or how much greater the first flow is relative to the second flow.

Thus, claims 8 and 12-14 are patentable over *Kimura* in view of *Nagahara*. Therefore, the Appellants submit that claims 8 and 12-14, as they now stand, fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder.

3. Claims 16-18

Claims 16-18 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Kimura* in view of *Nagahara*. The Appellants respectfully disagree.

The combination of *Kimura* and *Nagahara* do not recite all of the elements recited in claims 16-18. Claim 16 recites a first means for providing polishing fluid to the polishing surface at a first rate and a second means for providing polishing fluid to the polishing surface at a second rate, wherein the first means flows a greater volume of polishing fluid on a first portion of the polishing surface as it interfaces with the substrate than the polishing fluid of equal concentration disposed on a second portion of the polishing surface by the second means.

As discussed above, *Kimura* and *Nagahara* cannot be properly combined to teach or suggest means that provide polishing fluid on a first portion of the polishing surface as it interfaces with the substrate than the polishing fluid of equal concentration disposed on a second portion of the polishing surface, as recited by claim 16.

Thus, claim 16, and claims 17-18 that depend therefrom, are patentable over *Kimura* in view of *Nagahara*. Therefore, the Appellants submit that claims 16-18, as they now stand, fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder.

4. Claim 17

Claim 17 depends directly from claim 16, and recites additional limitations therefor. Since the alleged combination of *Kimura* in view of *Nagahara* do not render claim 16 obvious, dependent claim 17 is also not unpatentable and is allowable for the same reason stated above.

Furthermore, dependent claim 17 specifically recites the additional limitation of "wherein each means is independently controllable". The combination of *Kimura* and *Nagahara* does not teach independently controllable means for providing polishing fluid that dispense a greater volume of polishing fluid on a first zone of a polishing surface as it interfaces with the substrate than the polishing fluid of equal concentration dispensed on a second zone of the polishing surface. Thus, claim 17 is patentable over *Kimura* in view of *Nagahara*.

Therefore, the Appellants submit that claim 16, as it now stands, fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder.

5. Claims 23-25

Claims 23-25 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Kimura* in view of *Nagahara*. The Appellants respectfully disagree.

The combination of *Kimura* and *Nagahara* does not recite all of the limitations recited in claims 23-25. Claim 23 recites a method that includes flowing polishing fluid onto a first portion of a rotating polishing pad at a first rate, and flowing polishing fluid of equal concentration on a second portion of the polishing pad at a second rate that is different than the first rate, wherein the polishing fluid disposed on the first portion has a greater volume as it interfaces with a substrate being polished than the polishing fluid disposed on the second portion.

As discussed above, *Kimura* and *Nagahara* cannot be properly combined to teach or suggest a method that flows a greater volume of polishing fluid on a first portion of a polishing pad as it interfaces with a substrate being polished than the polishing fluid flowed on a second portion, as recited by claim 23.

Thus, claim 23, and claims 24-25 that depend therefrom, are patentable over *Kimura* in view of *Nagahara*. Therefore, the Appellants submit that claims 23-25, as they now stand, fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder.

6. Claim 30

Claim 30 stands rejected under 35 U.S.C. §103(a) as being unpatentable over *Kimura* in view of *Nagahara*. The Appellants respectfully disagree.

The combination of *Kimura* and *Nagahara* does not recite all of the limitations recited in claim 30. Claim 30 recites a first nozzle coupled to a delivery portion of a delivery arm and supported over a first zone defined on a

polishing material by a volume of polishing fluid provided by the first nozzle, and at least a second nozzle coupled to the delivery portion of the delivery arm and supported over a second zone defined on the polishing material by a volume of polishing fluid provided by the second nozzle that is different than the volume provided to the first zone, wherein the polishing fluid in the first zone and the second zone have equal concentration when rotated into contact the substrate.

As discussed above, *Kimura* and *Nagahara* cannot be properly combined to teach or suggest a system having a first zone defined on a polishing material by a volume of polishing fluid provided by a first nozzle, and a second zone defined on the polishing material by a volume of polishing fluid provided by a second nozzle that is different than the volume provided to the first zone, wherein the polishing fluid in the first zone and the second zone have equal concentration when rotated into contact the substrate, as recited by claim 30.

Thus, claim 30 is patentable over *Kimura* in view of *Nagahara*. Therefore, the Appellants submit that claim 30, as it now stands, fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder.

7. Claim 31-33 and 35-39

Claims 31-33 and 35-39 stands rejected under 35 U.S.C. §103(a) as being unpatentable over *Kimura* in view of *Nagahara*. The Appellants respectfully disagree.

The combination of *Kimura* and *Nagahara* does not recite all of the limitations recited in claims 31-33 and 35-39. Claim 31 recites a system having a first zone defined on a polishing material having a first volume of polishing fluid disposed thereon, a second zone defined on the polishing material radially inward of the first zone and having a volume of polishing fluid disposed thereon that is different than the first volume of polishing fluid of the same concentration disposed on the first zone when contacting the substrate positioned on the polishing material, and an arm having a first nozzle and a second nozzle coupled thereto, the first nozzle positioned to deliver a first flow of polishing fluid to the

first zone, and the second nozzle positioned to deliver a second flow of polishing fluid to the second zone that is different than the first flow.

As discussed above, *Kimura* and *Nagahara* cannot be properly combined to teach or suggest a system having a first and second zones defined on a polishing material having different volumes of polishing fluid of the same concentration disposed thereon, and an arm having a first nozzle and a second nozzle coupled thereto and respectively positioned to deliver different flows of polishing fluid to the first and second zones, as recited by claim 31.

Thus, claim 31, and claims 32-33 and 35-39 that depend therefrom, are patentable over *Kimura* in view of *Nagahara*. Therefore, the Appellants submit that claim 31-33 and 35-39, as they now stand, fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder.

8. Claims 36-38

Claims 36-38 depend directly, or indirectly, from claim 32 and recite additional limitations therefor. Since the alleged combination of *Kimura* in view of *Nagahara* do not render claim 32 obvious, dependent claims 36-38 are also not unpatentable and are allowable for the same reason stated above.

Furthermore, dependent claim 36 specifically recites the additional limitation of "wherein each nozzle is independently controllable". Dependent claim 37 recites "wherein the first flow is at least 1.15 time greater than the second flow". Dependent claim 38 recites "wherein first flow is about 1.2 to about 20 times the second flow rate". The combination of *Kimura* and *Nagahara* do not teach a independently controllable nozzles that dispenses a greater volume of polishing fluid on a first zone of a polishing surface as it interfaces with the substrate than the polishing fluid of equal concentration dispensed on a second zone of the polishing surface, or how much greater the first flow is relative to the second flow. Thus, claims 36-38 are patentable over *Kimura* in view of *Nagahara*.

Therefore, the Appellants submit that claims 36-38, as they now stand, fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder.

9. Claims 26-27

Claims 26 and 27 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Kimura* in view of *Nagahara* as applied to claim 23 above, further in view of United States Patent No. 5,433,650, issued July 18, 1995 to *Winebarger* ("*Winebarger*"). The Appellants respectfully disagree.

Kimura in view of *Nagahara*, and further in view of *Winebarger* does not recite all of the limitations recited by claims 26 and 27. As discussed above, *Kimura* and *Nagahara* cannot combine to teach or suggest all of the limitations described in claim 23, from which claims 26 and 27 depend. *Winebarger* teaches a method for polishing a substrate in which the polishing rate of the substrate is automatically adjusted during the polishing process. In one embodiment, *Winebarger* describes a closed loop polishing process in which the polishing rate is automatically adjusted by modifying the frequency at which slurry is dispensed onto the polishing surface or the quantity of slurry that is dispensed. *Winebarger*, column 4, lines 24-26. However, *Winebarger* does not teach or suggest flowing a polishing fluid at a first location at a first rate and flowing a polishing fluid of equal concentration at a second location at a second rate that is different from the first rate, as recited by claim 23, from which claims 26 and 27 depend. Therefore, *Winebarger* does not teach or suggest a modification to the combination of *Kimura* and *Nagahara* that would yield a method having all of the limitations recited by claims 26 and 27.

Thus, claims 26 and 27 are patentable over *Kimura* in view of *Nagahara*, and further in view of *Winebarger*. Therefore, the Appellants submit that claims 26-27, as they now stand, fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder.

10. Claim 34

Claim 34 stands rejected under 35 U.S.C. §103(a) as being unpatentable over *Kimura* in view of *Nagahara* as applied to claim 31 above, further in view of United States Patent No. 6,139,406, issued October 31, 2000 to *Kennedy* ("*Kennedy*"). The Appellants respectfully disagree.

Kimura in view of *Nagahara*, and further in view of *Kennedy* does not recite all of the limitations recited by claim 34. As discussed above, *Kimura* and *Nagahara* cannot combine to teach or suggests all of the limitations described in claim 31, from which claim 34 depends. *Kennedy* teaches a combined slurry and rinse arm in which a slurry delivery line or multiple slurry delivery lines are disposed within the arm. However, *Kennedy* does not teach or suggest different volumes of polishing fluid of equal concentration disposed on a polishing material when contacting the substrate positioned on the polishing material as recited by claim 31, from which claim 34 depends. Therefore, *Kennedy* does not teach or suggest a modification to the combination of *Kimura* and *Nagahara* that would yield a system having all of the limitations recited by claim 34.

Thus, claim 34 is patentable over *Kimura* in view of *Nagahara*, and further in view of *Kennedy*. Therefore, the Appellants submit that claim 34, as it now stands, fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder.

CONCLUSION

For the reasons advanced above, Appellants respectfully urge that the rejection of Claims 1-27 and 30-39 as being unpatentable under 35 U.S.C. §103 is improper. Reversal of the rejections in this appeal is respectfully requested.

To the extent necessary, a petition for an extension of time under 37 C.F.R. §1.136 is hereby made. A check in the amount of $330.00 for the Appeal Brief under 37 C.F.R. §1.17(c) is enclosed. If necessary, please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 20-0782, and please credit any

excess fees to the above referenced deposit account.

Respectfully submitted,

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*****EXPRESS MAIL CERTIFICATION*****

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Allyson M. DeVesty
Signature

Allyson M. DeVesty
Name

12-1-03
Date of signature

APPENDIX I

PENDING CLAIMS

1. (Previously Presented) A system for delivering a polishing fluid to a chemical mechanical polishing surface comprising:

a rotating polishing material having an upwardly facing polishing surface for polishing a substrate thereon;

an arm having a delivery portion disposed at least partially over the polishing surface;

a first nozzle disposed on the delivery portion and adapted to flow the polishing fluid at a first rate; and

at least a second nozzle disposed on the delivery portion and adapted to flow the polishing fluid at a second rate that is different than the first rate, wherein the first nozzle dispenses a greater volume of polishing fluid on a first portion of the polishing surface as it interfaces with the substrate than the polishing fluid of equal concentration dispensed on a second portion of the polishing surface by the second nozzle.

2. (Original) The system of claim 1 further comprising a flow control device coupled to the first nozzle.

3. (Original) The system of claim 2 further comprising a second flow control device coupled to the second nozzle.

4. (Original) The system of claim 2, wherein the flow control device is a flow control selected from the group consisting of orifices, needle valves, proportional valves, pinch valves, restrictors, mass flow controllers and a metering pumps.

5. (Original) The system of claim 1, wherein the arm further comprises a polishing fluid delivery line coupled to both the first and second nozzle.

6. (Original) The system of claim 1 further comprising a first fluid source coupled to the first nozzle and a second fluid source coupled to the second nozzle.

7. (Original) The system of claim 1 further comprising a plurality of nozzles adapted to flow polishing fluid at a controlled rate.

8. (Original) The system of claim 7, wherein each nozzle is independently controllable.

9. (Original) The system of claim 1 further comprising a rotating platen adapted to support a polishing material, the polishing material comprising the polishing surface.

10. (Original) The apparatus of claim 9, wherein the polishing material is a polyurethane pad or a fixed abrasive pad.

11. (Original) The system of claim 10, wherein the polishing material is a web of fixed abrasive.

12. (Original) The system of claim 1, wherein the first nozzle is disposed radially inward of the second nozzle relative to a center of rotation of the polishing pad, and wherein the first flow is at least 1.15 time greater than the second flow.

13. (Original) The system of claim 1, wherein first flow is at least 1.15 times the second flow rate.

14. (Original) The system of claim 1, wherein first flow is about 1.2 to about 20 times the second flow rate.

15. (Original) The system of claim 1 further comprising a metrology device adapted to provide information utilized to control at least one of the flows through the nozzles.

16. (Previously Amended) A system for delivering a polishing fluid to a chemical mechanical polishing surface comprising:

a polishing surface adapted to polishing a substrate in contact therewith;

an arm having a delivery portion disposed at least partially over the polishing surface;

a first means for providing polishing fluid to the polishing surface at a first rate; and

a second means for providing polishing fluid to the polishing surface at a second rate, wherein the first means flows a greater volume of polishing fluid on a first portion of the polishing surface as it interfaces with the substrate than the polishing fluid of equal concentration disposed on a second portion of the polishing surface by the second means.

17. (Original) The system of claim 16, wherein the first and second means are independently controllable.

18. (Original) The system of claim 16 further comprising one or more additional means for providing polishing fluid to the polishing surface disposed between the first means and the second means.

19. (Previously Presented) A system for delivering a polishing fluid to a chemical mechanical polishing surface comprising:

a platen supporting the polishing surface;

a polishing head disposed over the platen and adapted to hold a substrate against the polishing surface;

an arm having a delivery portion disposed at least partially over the polishing surface;

a first nozzle disposed on the delivery portion and adapted to flow the polishing fluid at a first rate to a first portion of the polishing surface; and

at least a second nozzle disposed on the delivery portion and adapted to flow the polishing fluid at a second rate that is different than the first rate to a second portion of the polishing surface, wherein the polishing fluid flowed on the first portion has a greater volume as it interfaces with the substrate than the polishing fluid of equal concentration flowed on the second portion by the second nozzle.

20. (Original) The system of claim 19, wherein at least the first flow is controllable.

21. (Original) The system of claim 20, wherein the second flow is controllable.

22. (Original) The system of claim 19 further comprising a metrology device adapted to provide information utilized to control at least one of the flows through the nozzles.

23. (Previously Presented) A method of supplying a polishing fluid to a chemical mechanical polishing surface comprising:

flowing polishing fluid onto a first portion of a rotating polishing pad at a first rate; and

flowing polishing fluid of equal concentration on a second portion of the polishing pad at a second rate that is different than the first rate, wherein the polishing fluid disposed on the first portion has a greater volume as it interfaces

with a substrate being polished than the polishing fluid disposed on the second portion.

24. (Original) The method of claim 23, wherein the first rate is independently controllable relative the second rate.

25. (Previously Presented) The method of claim 23 further comprising:

flowing the polishing fluid on the pad at one or more locations between the first portion and the second portion.

26. (Original) The method of claim 23, wherein the step of flowing the polishing fluid at a first rate further comprises:

adjusting the flow rate during polishing.

27. (Original) The method of claim 26, wherein the step of adjusting further comprises:

adjusting the flow rate in response to a polishing metric.

30. (Previously Presented) A system for delivering a polishing fluid to a chemical mechanical polishing surface comprising:

a rotating polishing material having an upwardly facing polishing surface for polishing a substrate thereon;

an arm having a delivery portion disposed at least partially over the polishing surface;

a first nozzle coupled to the delivery portion and supported over a first zone defined on the polishing material by a volume of polishing fluid provided by the first nozzle; and

at least a second nozzle coupled to the delivery portion and supported over a second zone defined on the polishing material by a volume of polishing fluid provided by the second nozzle that is different than the volume provided to

the first zone, wherein the polishing fluid in the first zone and the second zone have equal concentration when rotated into contact the substrate.

31. (Previously Presented) A system for delivering a polishing fluid to a chemical mechanical polishing surface comprising:

a rotating polishing material having an upwardly facing polishing surface for polishing a substrate thereon;

a first zone defined on the polishing material having a first volume of polishing fluid disposed thereon;

a second zone defined on the polishing material radially inward of the first zone and having a volume of polishing fluid disposed thereon that is different than a volume of polishing fluid of the same concentration disposed on the first zone when contacting the substrate positioned on the polishing material; and

an arm having a first nozzle and a second nozzle coupled thereto, the first nozzle positioned to deliver a first flow of polishing fluid to the first zone, and the second nozzle positioned to deliver a second flow of polishing fluid to the second zone that is different than the first flow.

32. (Previously Presented) The system of claim 31 further comprising a flow control device coupled to at least one of the first or second nozzles.

33. (Previously Presented) The system of claim 32, wherein the flow control device is a flow control selected from the group consisting of orifices, needle valves, proportional valves, pinch valves, restrictors, mass flow controllers and metering pumps.

34. (Previously Presented) The system of claim 31, wherein the arm further comprises a polishing fluid delivery line disposed within the arm coupling the first and second nozzles.

35. (Previously Presented) The system of claim 31 further comprising a first fluid source coupled to the first nozzle and a second fluid source coupled to the second nozzle.

36. (Previously Presented) The system of claim 31 further comprising a plurality of independently controllable nozzles coupled between the first and second nozzles, the independently controllable nozzles adapted to flow polishing fluid at a controlled rate.

37. (Previously Presented) The system of claim 31, wherein first flow is at least 1.15 times the second flow rate.

38. (Previously Presented) The system of claim 31, wherein first flow is about 1.2 to about 20 times the second flow rate.

39. (Previously Presented) The system of claim 31 further comprising a metrology device adapted to provide information utilized to control at least one of the flows through the nozzles.